

# AVIATION WEEK

A MCGRAW-HILL PUBLICATION

June 4, 1951

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A YEAR

## You'll find a steaming **JUNGLE** —third door to your right

This sleek doorway belongs to the new plant and offices of Honeywell's Aeronautical Division. Outwardly it looks like other modern manufacturing buildings in Minneapolis.

But step into the environmental test laboratory and you'll find a chamber containing a jungle-type atmosphere of oppressive humidity and tropical fungus. Here, Honeywell Autopilots, gyros, fuel gauge components and other equipment are tested under rigid U. S. Air Force and Navy specifications for resistance to *Penicillium Lateum* and eight other fungi. Performance requirements are high—be-

cause fungus-susceptible electronic equipment is useless in many parts of the world.

The fungus chamber is just one part of Honeywell's Environmental Testing Laboratory. Others test for effects of heat, cold, vibration, salt spray, humidity, sand and dust on Honeywell equipment.

Environmental tests are just one phase of Honeywell's continuing research on aeronautical control problems. We expect not only to continue, but to expand this research program—because *automatic control* is such an important part of aviation progress. And *automatic control* is Honeywell's business.



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# HYDRAULICS FOR MISSILES



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### GUIDED MISSILES NOW CONTROLLED BY POWER SUPPLIED BY BENDIX-PACIFIC HYDRAULIC ACCUMULATORS

Extensive research and development work has been undertaken by Bendix-Pacific to adapt hydraulic power to the control of missiles in flight. Already Bendix-Pacific standard hydraulic accumulators are being used in this work and Bendix-Pacific engineers are available to assist in other specialized applications.

As part of this program Bendix also has developed for the Air Force an automatic hydraulic power unit which provides for repeated charging of the accumulator in flight.

In addition to supplying other hydraulic components Bendix-Pacific now will be in production of electro-neuro valves designed specifically for missile application.

Bendix-Pacific will be glad to discuss its developments in this field. Your inquiry is invited.

**Pacific Division**  
Bendix-Automatic Corporation

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# B.F. Goodrich



## Airplane tire brings costs down to earth without touching the ground

Once or twice the cost of moving cargo by air is the time and expense of getting it on and off the plane. But when Douglas designed the Globemaster II, they had some ideas which pointed to cut plane loading costs way down. They put huge clamshell doors and ramps into the nose for faster loading. And something they installed as a device that would handle cargo in a fraction of the usual time.

The device was designed to be powered by two electric motors with rubber-and-steel driving wheels. But here, the Douglas engineers ran into a prob-

lem. The wheels called for G-rub rubber tires which would give good traction under all kinds of operating conditions. The tires would have to withstand stresses of —60°F without shrinking away from the track they rolled on. They would also have to take heavy loads without becoming permanently misshapen. Looking for the right kind of rubber for the job, Douglas engineers brought the problem to D. F. Goodrich.

In manufacturing puller rollers—rubber wheels that carry heavy loads in factories—B. F. Goodrich had already

developed a special rubber compound which lasted so long it might do the trick. Tires were made of this compound for the Douglas C-124 and were used under extreme temperatures and loads. And the hole was proved to be the answer. They're another example of how B. F. Goodrich research in rubber is helping the aviation industry with some of its toughest problems. The B. F. Goodrich Company, Aero-nautics Division, Akron, Ohio

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NEWS DIGEST

## DOMESTIC

Young C-97 flew nonstop from Hickam AFB, Hawaii, to Kelly AFB, Tex., in just one minute less than 12 hr for the 4,000-mph-plus flight. It averaged 333.6 mph to cut the previous mark for that flight by 16 min. It was a routine MATS trans-Pacific mission.

Electronic school for training Air Force and Bendix field engineers in maintenance of military electronic equipment has been set up by Bendix Radio division on a 40-acre tract at Foothill Airport, near Baltimore.

Thurmer A. Sims has been named assistant general manager of Hemlock Standard, division of United Aircraft Corp. Sims, a retired USAF brigadier general, was formerly general manager of the Fossiloid NEPA Project at Oak Ridge, Tenn.

Dr. W. Randolph Lovelace II has been appointed chairman of the Armed Forces Medical Policy Council, effective July 1, succeeding Dr. Richard L. Moulding. Dr. Lovelace, a colonel in the USAF reserve, has served for a number of hospitals and two civil sectors.

Remington Rand is to build Walter Kofke & Co. B-1 automatic gas-charged gas bomb and light gas at Remington Rand's Elmsford, N. Y., plant. The 30-cal. gas-charged system is the compressed air principle, a much lighter than World War II types and tests indicate it will operate longer than the firing life of the gun.

**Joint airmground support team** composed of representatives from Navy Air Force (Tactical), Pope AFB, and the Army Air Support Center, Ft Bragg, is tracing U.S. military losses in Europe on a tracking program designed to acknowledge ground troops in the use of air support, and so teach Air Force units how to provide it.

Robinson Airlines asked CAA proto-type aircraft advisory committee help work to reorganize a contract to test commercial copter operations between Broome (N.Y.) County Airport and Madison Manhattan, N.Y. But also want say it is unlikely that helicopters will be considered for local service until DCI-3 one two engine can be available.

Reported propeller seizure in midair was being investigated by an Air Force inquiry board from Wright-Patterson.

APB in the crash of the crash of USAF Douglas C-124 Globemaster in Indiana, May 29. Of 12 aboard, the five survivors were seriously injured, following an emergency belly landing.

## FINANCIAL

Forchard Engine & Marine Corp. had net earnings of \$3,044,763 for 1950 on total sales of \$80,236,770 making this the most profitable year in the company's history. Bucking had increased from \$118.2 million at Dec. 31 to approximately \$175 million on May 31.

Northwest Airlines showed a net income of \$316,327 in April, compared with a loss of \$493,546 in the same period last year. Total operating revenues for the current period rose \$1,573,935 compared with \$8,613,896 in the same month in 1990. Reported losses for the first quarter of this year were \$1,614,536 as against \$5,811,637 for the first three months last year.

## INTERNATIONAL

Canadian government has placed orders for more than 99 million in defense orders during the last two weeks in April, with \$731,460 distributed to aircraft, parts and equipment. De Havilland Aircraft of Canada, Ltd. Toronto, got \$243,667.

As transport agreement recently signed between India and the Netherlands gives the latter the right to operate from Amsterdam via India to Jakarta and beyond if desired, and from Amsterdam via India to the Philippines or China and beyond if desired, India gets rights to Amsterdam and beyond and via New Guinea to Australia.

Canadian Pacific Airline will be operating D61 Const jet transports within a year, says Grant MacDonell, CPTA president. On a visit to the British company he was told that the Const had averaged 917 mph over 2,800 mi at 41,000 ft.

Hawker Aircraft Co. has been awarded a contract to build and locate a new factory at Queens's Gate, Blackpool, England by the Board of Trade, adding 1.5 million sq. ft. to the firm's production capacity.

A five-mile long runway for light planes at the RCMP is being built at Uplands Airport, Ottawa. First phase to be completed this year, will be 3,500 ft long and 180 ft wide with a concrete runway 3,000 ft by 200 ft, plus taxiways. This will cost about \$1.5 million.

### Glideslope Receiver

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This shows circuit board profile. Features in circuit including metal and arrangements are in accordance with India Technical Committee for American specifications. Standard frequency range 500-5000 MHz. Weight 11 kg. 8 mm.



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### ROTORette

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## SIDELIGHTS

### Cleek & Dogger Stuff

The fight over unscheduled air access was heated last week by disagreement of a copy of a staff study written by investigative counsel Laurence G. Hirschman as the sub-plot for the Senate Staff Business Subcommittee. As a result, the report failed to at least one major scheduled line and from there to CAA. Nevertheless, CAA members who read it as too favorable to the subject of staff and are bringing pressure to limit it reveal. Committee members say they have not approved the draft. They have been deferring action for several weeks. Other developments: (1) The committee heard oral testimony before they do investigation charges that articles in *Conquest* and *Conquest* of making the committee an obstacle and were rejected by scheduled action to their not cooperation. The first main witnesses, a *Conquest* editor, the *Conquest* editor, a *Conquest* writer, and W. W. Conway, writer, divided in largely divergent views of the substance the committee decided Justice was better suited to get at the facts. (2) CAA has proposed effective date to July 1 for its jurisdiction on non-both to these two models. (3) Air Corps Transport team said its members flew over a billion revenue passenger miles in the past 22 months without suffering a fatal accident.

### Air Transport

CAA will let South Agency run their usual two summer flights to Europe to run for 745 persons Agency says it landed before Mar. 21, the date CAA decided against its more agency flights. Prospect a CAA will issue their cruise orders to TWA and PAN to which contracting their North Atlantic service beyond June 31 regardless of their cutbacks. Because of the record, it is looking if it is the first. Otherwise, CAA spokesman anticipates that would not others might make both for U. S. Europe routes proposing the case. They view the PAN/AA merger case as establishing a two-way pulse for the North Atlantic. Should legislation on separation of industry from mail per se be introduced, there be looked the case as for domestic routes? Air Coordinating Council's report on the to the Senate Interstate & Foreign Commerce Committee a day this week or soon. AGC will receive a separate study and show how complex are the problems of international mail service and comparing contemporary and past practice.

### Civil Aviation

The NASR Air Maintenance Society shows 95,000 U. S. non-military planes are in active, usable condition. Of them, 30 percent are used in general aviation, including 3,000 owned by corporations and 10,000 engaged in farm work. Air Taxi Conference has gotten off to a good start, with increase of the helpful article of telephone numbers. Bush: Census Dept.



NERVE CENTER at NACA's Wallops Island, Va., plots aircraft research studies in this control room. All flight checkouts are made from here; all flight test information is sent here by aircraft equipment in the aircraft as on the ground (Aviation Week, May 26, p. 18)



THIS-EMITTER receiving wireless signals designed for the purpose, can add electronics against the sky. These wireless receive signals from the aircraft and relay them to electronic receiving gear in the control building below.

## Avonics: Key to New Missile Research

DOPLER VELOCITY radar determines speed of rocket-powered aircraft models as they streak over from launching site. Operator tracks model line in sight, later to be used. Set can track 21 different bodies.

INSTALLATION of measuring equipment in chase of a model is done by electronics specialists in Avonics Research Division. Equipment transmits flight parameters to ground station.





## IN THE NEWS TURBOPROPS

The Turbojets, most powerful propeller aircraft powerplant in the country, delivers more than 8000 horsepower in addition to an undisturbed amount of thrust. Here, Joe LaFuerce, manager of G-E's Aircraft Gas Turbine Division, and Yip Weaver, in charge of the Turbojet project, take a look at the engine on the stand where it is undergoing rigorous tests.

Two years ago, in July, 1941, G-E engines started work on a new type aircraft powerplant—an axial flow gas turbine driving a propeller. This was the TG-308, the first turboprop in the country and the forerunner of thrust power engines.

General Electric engineers today are experimenting with the Turbojets, a Turbojet development. Although larger five engines for today's transport needs, the Turbojet presents an ideal vehicle for testing new ideas and methods.

New and improved turboprop engines are in the books at General Electric. Light weight and high power, these engines will steadily be lifting new records to new seas and new records.

When you're considering powerplants, call in the company that pioneered the aircraft gas turbine industry. Turbojet your General Electric aviation specialist, or write General Electric Company, Schenectady 5, N. Y.



General XF-40, first turboprop-powered aircraft to fly in U.S., powered by TG-100, first American turboprop.



Design engineers Alvin Harold and C. J. Walker, stand on early TG-100 turboprop on test stand in Schenectady.

AIRCRAFT GAS TURBINES

**GENERAL ELECTRIC**

## WHO'S WHERE

### In the Front Office

C. Dale Hildebrand has been appointed as senior assistant to the vice president, operations and maintenance, of Capital Aircraft Hildebrand has been with Capital ten years and was a lieutenant colonel with the AAF in World War II.

### Changes

D. A. Flinn has been made senior sales representative for Aerodynamics division of General Motors and will be based in Washington. — Ross Dumas, formerly with Douglas Aircraft, has joined Pratt & Whitney Co. as manager of northwest operations, with headquarters in Seattle. — Francis Blum is now sales representative for Aerojet Corp., N. J., succeeding Charles Wheeler, who resigned.

Dr. Louis Y. Kates has been appointed assistant manager of engineering of General Electric's Control division at Schenectady, N. Y.

F. J. Soreglio has been named chief test engineer for Texaco Mfg. Co.'s Aircraft division at the new Chicago, Calif., plant. — Perry R. Cope, formerly with Armstrong Whitworth Aircraft Ltd., has joined A. V. Roe Canada as a test pilot to work on the CP-100 jet fighter program. — Nelson Howland, an Aero Canada's new light aircraft and test pilot.

Colin M. Barrett has joined B. F. Goodrich Co.'s Automation, Aviation and Controls Sales division in Detroit. — W. R. Dalton has become a field engineer in the Wichita area for Wm. R. Whitaker Co. Ltd.

John R. Jule has been promoted to assistant manager of the aviation section of Ingersoll Rand Industrial Products division.

Joe E. Bowdler has been appointed chief of the radio communications engineering section of Kellogg Instrument Corp. — Jack O'Brien, formerly president of Calsonic Inc. (Boston) has joined General Corp. of Los Angeles as company test pilot.



SWORN TOGETHER—CAA. Administrators Charles F. Hesse, left, and Carl Charnes, right, are shown with the new five-man executive committee, which included Boeing, Douglas, Chance, Lockheed and Avco, Inc. Lockheed is reported to be favored as the probable winner.

AVIATION WEEK, June 6, 1951

## INDUSTRY OBSERVER

► Another indication of the handover process between the Kellogg Instrument Corp. into the communications field. Kellogg built its reputation on instruments—the indicators of what was happening somewhere along the line in a communications system. Now the company is going back to the source of the instrument to build complete systems. One of the fields likely to be penetrated first by Kellogg is its expanded activities in telecommunication.

► Borch Aircraft is building nine preproduction Twin Boomer, in addition to the first two now flying, then will start its first production run at 180, all of them already assembled for four sides with deposits. This is in addition to military sales of the Twin Boomer to the Army.

► The armed services are studying the use of magnetic bearing amplifiers to replace present gyro compasses, and gyro compasses, and reducing swing. A joint conference with electronic manufacturers soon will be held to replace the subject. Magnetic bearings, it is noted, can replace up to 90 percent of vacuum tubes in certain computers.

► De Havilland's U. S. sales campaign for the Dove as an executive plane has been so successful that DHI has had to stop accepting new distribution. Present distribution have over-sold the quiet DHI originally set up for U. S. sales for the year. The company's big campaign at the moment is to line up enough Dove service bases to take care of the plane in any part of the country.

► Ground tests have been completed on the MC-4, McCulloch Motors Corp.'s tandem rotor helicopter. All minor bugs and test data were of preliminary. Approximately 180 flight hours remain before McCulloch gets its XTG.

► Borch Aircraft is moving more and more into the defense aircraft production picture. Borch is now being considered strongly as a second source for production of the Chase C-423 assault transport. In addition it has two Borch and Model C-48 U. S. and Canadian military contracts, and component contracts.

► Texas Engineering & Manufacturing Co., Dallas, received its largest contract, to build major components of the Douglas A1D Skyhawk turboprop attack fighter. The new multimillion dollar order steps up Texas's backlog to over \$50 million, and makes Texaco one of the most important sub-contractors in the industry. It and its subsidiary, Leachman, Argonne Corp., are now making components for five major U. S. airplane manufacturers.

► Borch Helicopters reports a two-hour hands-off flight in a standard commercial EHO 168, fitted with the new four stick control system for auxiliary training. The two-place machine carried Capt. George Brodway, Engineer Corps topographer, student, and instructor James Mott. After Brodway trimmed controls for landing flight at 60 mph, near Palo Alto, Calif., they let controls go unattended for over two hours.

► Decision of the USAF Senior Officers Board as to winner of the usually completed design competition for a 35,000-lb. payload transport (Aviation Week, May 7) will be announced June 17. Of the five remaining competitors, which included Boeing, Douglas, Chance, Lockheed and Avco, Inc., Lockheed is reported to be favored as the probable winner.

► Competition to determine long-range mission capabilities of these machine transports, Fairchild C-119, Douglas Super DC-3 and Chase XC-121 will be resumed at Eagle AFB, next week. Competition was postponed approximately six weeks ago.

► Studies made of operating requirements for Marine Corps helicopter squadrons, indicate that they will need about 1.5 pilots per set of controls for actual operating outfits including gyro pilots, jettison, etc., etc., about three pilots per set of controls will be needed.

## 150-Wing USAF

Some congressional support has developed for the quick USAF buildup to 150 wings that is being pushed by Sen. Henry Cabot Lodge. But key Capitol Hill figures are skeptical of his views.

Sen. William Knowland, Wayne Morse, Ernest McFarland, and Kenneth Wherry probably will back up Lodge's fight for more air power.

Knowland and Morse, along with Lodge, don't like the Administration's "halfhearted" defense buildup. A \$94-billion defense budget, Morse says, would be more in order than the \$60 billion proposed by the President for the coming year. Knowland is on the Appropriations subcommittee that allocates money for defense. Morse is a member of the Armed Services Committee.

McFarland was one of Navy's strongest spokesmen on Capitol Hill a few years back. But now he leans off the 55 wing USAF program of the Administration in "thoughtful reluctance to exert our commitments." He is making speeches on USAF establishment calling for 150 wings if the world situation demands it.

Wherry naturally thinks \$60 billion is the top the country can "afford" for defense. But he wants a dose of Army funds transferred to USAF for the 150-wing buildup.

On the House side, there's only token support for the 150-wing program so far. Rep. John Dorn plans to introduce legislation. "It won't accomplish much, aside from focusing attention on the issue," he observes.

Working against the buildup is the fact that two key House Republicans, Chairman of the House Armed Services Appropriations subcommittee, and Sen. Joseph McCarthy, chairman of the Senate Armed Services Appropriations subcommittee—usually opponents of the need for 150 USAF wings. Chairman Carl Albert of the House Armed Services Committee, influential since on defense matters, is unenthusiastic too, says he is "wondering it over."

## Challenge for Strategic Air

An Force is concerned over two developments threatening the effectiveness of its strategic air arm as the country's first line of defense:

- Recent progress of dispersion and getting underground its isolated plants ("going on now for some years," according to Senate Armed Services Committee Member Wayne Morse) means that targets will be difficult to locate and difficult to put out of commission.
- Strategic Air Command's Lt. Gen. Curtis LeMay observed: "It is possible to build a plant so far underground that strategic bombs will have practically no effect on it. However there are other ways of doing the job."

The implication: It would take atomic bombs—more and in limited supply. It is questionable whether they would be expended on isolated plants or on shock-bombard attacks on underground targets.

- "Limited warfare" of the Korean pattern minimizes the role of strategic air. It reduces it to little more than an advance tactical air operation. And the Administration's policy of "continuation" holds the possibility of a series of localized "limited" wars—a point

Morse Corps is emphasizing in its congressional drive for expansion. Backed by legislation doubling the Corps to four divisions and four air wings again that enable Morse contracts are lost most quickly and often likely to meet the challenge of Russian satellite aggressions whenever and wherever they develop throughout the world.

## Army Air Decline?

Army contracts for planes shot up from \$7.1 million in the 1948 fiscal year to \$174 million for the current 1951 fiscal year. Only \$1.5 million is estimated for aircraft contracts for the 1952 fiscal year which starts July 1.

Actually, the drop in Army plane buying next fiscal year won't be as sharp as the figure indicates. Army has just saved \$45.7 million of the \$114 million for the current year. Contracts under it will run into the '52 fiscal year. Army says that \$20.3 million for 1951 and \$47.9 million for 1952 would more accurately reflect the trend in plane buying.

The main reason for the Army's decreasing interest in planes is its counting on atomic artillery to replace tactical air support, partially at least. Army's Chief of Staff Gen. J. Lawton Collins recently reported what would be atomic artillery's two major advantages over tactical air:

- It would be effective for close-in operations—attacking or approaching camps. Tactical air must operate enough at a distance to preclude the possibility of being so friendly targets.

- Atomic artillery would be as effective night weapons—without night aid at all.

Rep. Orrin Brooks, a member of House Armed Services Committee, reports that air personnel believe artillery still available for use in Korea—where and if that top policy decision is made.

## More Plant Expansion

USAF and Navy will launch new plant expansion programs soon.

Congress last week voted Navy \$165 million and USAF \$170 million for building up and constructing additional aircraft plant capacity.

## Guided Missiles

Navy will shortly let contracts for production of its "two highest priority air defense missiles"—one under contract of Bureau of Aeronautics, the other under Bureau of Ordnance. Some of \$45.5 million is earmarked for the Buckler project, \$23.4 million for the Buckle project.

Navy also plans to invest \$76.7 million shortly in production facilities for the two missiles \$18.4 million for Buckler and \$41.6 million for Buckle.

USAF won't receive any money today to obligate on guided missile production or plant development until the 1952 fiscal year budget is approved, probably late in July.

—Katherine Johnson

## Industry Gears to Speed Subcontracting

Need to farm out a greater part of work is revamping former buying methods.

By William Kasper

Subcontracting has put a new turbo into the aviation manufacturing business, creating embossing of some purchasing departments, adding of new departments and bringing new elements of time and space to fabrication of aircraft, engines and equipment.

With the peak of subcontracting estimated as still 18-24 months away, the industry already has undergone changes to accommodate this new factor in manufacturing, it is claimed in AVIATION WEEK's survey on subcontracting.

For most companies, World War II ushered in subcontracting. But it was an organized assembly with little opportunity to pick and choose subcontractors, and resulted in costly duplication of inspection and quality control procedures.

The industry and government officials have learned better now.

How to do it—fitted with the accuracy to do more and more without having to meet shipping production schedules, despite machinery and manpower shortages, most companies have set up departments and then up roles especially for subcontracting. And they have joined with government officials in some definite advice for would-be subcontractors:

- Know your customer—what equipment you have and what it can do, what your customer can do. Present a list describing your plant, equipment and skills of vital employees.

- Try plants you use before looking to business off in the country. Deliver your time on price for some common business already is called.

- Subcontracting is a new time and distance element into this, and prime contractor must take this as close as possible. They also smooth contractual and technical relations.

- Don't go to Wright Field or to Washington if you want subcontracting. Remember, subcontractors come from other business firms like yours—not from the government.

- Go to your AMC Procurement District office, or phone its main office after you're stamped and don't know what subcontractors in your area might have subcontracting work. The AMC procurement districts are putting the drive for subcontracting and may be able to help you.

- Annual procurement classes as they are held at your area. If one has recently been held in your vicinity and you attend it, get in touch with your AMC procurement district and ask for the names of the prime manufacturers who exhibited. (For the story of the three direct already held, see AVIATION WEEK May 25 p. 18.)

- If you'll be one to get business right away. Many prime contractors who will have the largest business to fight, aren't ready yet. The subcontracting plants are mostly in this category. But they still must be busy from you. They won't build their new lines or they may register promptly when their production planning is completed.

To inform potential subcontractors just where the best chances of business might be, AVIATION WEEK published a market guide in its May 28 issue, page 15. The following companies are among those most active in subcontracting. Other companies will be covered next week.

### ALLISON

- Current Status—Actively seeking sub-contractors now and will be for the rest of the year. Is subcontracting about the heart of its work.

- Subcontracting—Power-Driven and machine parts, and mechanical assemblies.

- Future—Proportion of its work subcontracted will hold about the same level for the next year.

Address—Allison Engine Division, General Motors Corp., Indianapolis

### BELL AIRCRAFT

- Current Status—Actively seeking sub-contractors.

- Subcontracting—Schaumburg and subcontractors to its own specifications.

- Future—Intends to add in some sub-contractors as possible.

Bell is one of the companies that found it necessary to create a new department to handle its subcontracting needs. Called the Outlets Production Department, it is separate from the Production Department. Bell now has 350 workers in 21 states working for it, and at last year's end the Outlets Production and the Production Department had not order totaling \$75 million—which was greater than the company's sales in 1949. Bell is particularly interested in firms with highly skilled machine modern and, because of its specialized work on atomic and rocket engines, does not require that its subcontractors be near the home plant.

- Address—Bell Aircraft Corp., P. O. Box One, Buffalo 5.

### BOEING

- Current Status—Actively seeking sub-contractors.

- Subcontracting—House-Machinery, metal construction of buildings, wings, etc., all sorts of fittings.

Boeing has been among the most active in subcontracting since the war, and the extent of its subcontracting is that company probably spreads only on extent of its government orders. Now it subcontracted 87 percent of the dollar value of its airplanes, \$5 firms there \$134,500,000 worth of work for \$4.7 subcontract at Wichita, 100 firms, mostly in the Pacific Northwest, hold subcontracts at \$1.97 and \$1.90 production at Seattle. Wichita subcontracting is expected to rise to \$170 million.

Subcontracting is handled by the national department. Company is most interested in possible subcontractors near its plants, Seattle and Wichita. It crisscrosses applicants by type of facility, special products, and number of employees. Each applicant is graded according to the Boeing representative's estimate of the firm's suitability for

- Address—Boeing Airplane Co., Box 3107, Seattle 14 or Wichita 1.

### HAMILTON STANDARD

- Current Status—Actively seeking sub-









TRANSIT VAN can be shipped from railroad flat car to truck, then to air freighter.

## Pack Simplifies Cargo Handling

Aluminum unit eliminates freight-handling headaches, will fit in hold of C-124A, C-119 and XC-99.

By Alexander McFarley

A new concept in cargo packaging is an advanced development stage at Bethesda City, MD. It is designed to integrate air and surface cargo handling so as to eliminate many of the ground-handling headaches of today's air cargo system.

Transit Van Corp., headed by John A. Olson, (former Assistant Secretary of Commerce for Air), has two prototype aluminum shell cargo packs, already tested on railroads and trucks. Both are immediately adaptable to at least two of the principal cargo transporters now in production for the military services, the Douglas C-124A, Globemaster II and the Fairchild C-119 Packard. And the pack is also adaptable to use in the Cessna XC-99 six-engine transport, of which only one prototype aircraft is now in progress.

►Transport Interest—Olson reports that virtually every U.S. transport aircraft manufacturer has expressed interest in designing future cargo planes so they will be adaptable to the all-weather van, or pack.

Basically the Transit Van system rolls for use in an aluminum box or pack with dimensions 8 x 3 x 20 ft., accommodating 1,600 cu ft. of usable storage space. Weight-wise, the individual pack could carry up to 28,000 lb., but a load limit of 13.5 lb. per cu. ft. imposed on truck loads in some states would cut down the pack load to around 15,000 lb., or that less.

Two of the 20-ft. packs can be railroad flat car or, singly, they can be loaded

on standard truck-trailers with relatively simple adaptation.

One of the packs will fit, perhaps a little snugly, in the C-119 Packard's cargo hold. These can be tucked into the rear openings "hold" of the C-124A, and presumably the large XC-99 could carry as many as six at once.

The 5-ft. width dimension has been adopted specifically as the standard permissible width for highway trucks. Lowering the 5-ft. height will make the pack adaptable to standard 4 to 10-ft.-high truck trailer beds, since many states have a maximum height limitation of 13 ft. 6 in. for trucks. The 10-ft. length was chosen to make it possible to load two of the packs on a flat car.

►Pack Bodies Cheaper—Experiments conducted thus far have indicated designing aluminum monocoque semi-truck-type construction packs, as compared to standard truck-body construction packs, but the simpler and less expensive construction of the latter type indicates that it will probably be chosen for mass production.

A variety of methods of handling the packs in airplanes have already been considered. Among these:

• A thick all-wood airplane in which a number of the packs could be carried in the wing, suspended from overhead structures. To load this type of carrier, the pack would be rolled under the airplane on its own skids then hoisted in a separate arrangement within the wing. Northrop Aircraft has made studies of this type of arrangement for use with a Northrop Flying Wing,

which would be essentially a cargo version of the XB-35.

• Is an aircraft more like the Fairchild C-119 Packard, with a rear loading, the packs would be attached behind the fuselage to a strong overhead boom, without outside bracing.

• The packs could be rolled in through a rear door, in more conventional cargo planes with overhead fasteners, while other packs were being unloaded through a tail door.

Best utilization of the pack principle for air cargo calls for a large airplane which would accommodate as many as the order of a 100,000-lb. payload or more; the Transit Van concept has been calculated, with space for six or more of the packs.

Arrangements of wheels for the packs are still the subject of continued engineering studies. Some type of detachable wheels for airport handling will be incorporated. These could be attached to the front of the van and removed once clear passenger was moved.

More advantages of the Transit Van arrangement is seen in the quick handling of last-in-first-out shipments by two or more means of transportation.

►Railroad Tests—A 30-day test run with the prototype van on tracks of the Southern Pacific Railroad between Los Angeles and San Francisco, running one each direction each night is an actual experimental shipping operation, indicated important savings in time handling for loading and unloading, loading savings in the actual package charges at both ends. Operation involved loading the van on the flat-car dunnage frame trucks, transporting them to the rail terminal at destination, reversing the procedure, and trucking them to their consignees.

Transit Van says the new system will be equally adaptable to air cargo transportation for long hauls, where the average speed of the cargo plane will show its advantage, without the handling of this potential ground handling cargo system currently in use at airports today.

Advantages of the van system for military cargo skills have been stressed by Transit Van President Olson to cargo experts of MATS, Air Force, Navy, and Army, and to the Civilian Prototype Aircraft Advisory Committee, as well as to individuals for basic air cargo carrier and transport plane manufacturers.

At least some of the designs submitted for the 25,000-lb.-payload medium transport airplanes recently conducted by the Air Force were designed to accommodate packs of the van size, although this type airplane is somewhat smaller than Olson considers the most efficient size for carrying van packs.

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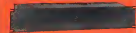
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Front and rear views of the Collins 766D-1 frequency shift keyer



Front and rear views of the Collins 766D-1 frequency shift keyer

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## AERONAUTICAL ENGINEERING

*The Atom—Power for Flight*

# The Engine: Fission Aloft

In February of this year came the dramatic announcement that the propulsion of aircraft by nuclear energy had been deemed a stated objective in theory. In simple words the aircraft industry was headed a new world full of possibilities and problems.

Since then, Atomic Wars has been planning material assembly to acquaint you with the new power derived from the atomic nucleus. The first would meet all the existing needs of aircraft with the same structure of the atom and particularly, of the atomic nucleus. A neutron, key to the locked door of the quiescence of nuclear power, can disrupt an atomic nucleus in the fission process, releasing tremendous amounts of energy. This appears in the form of kinetic energy of the fission products, and by radioactive reflexes, that energy is converted into heat.

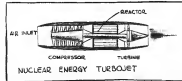
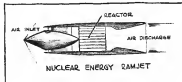
This heat can then be used, in quite conventional manner, to heat some working fluid to drive a turbo-generator and produce electrical power, for one example.

But we are concerned with the problems of propelling an aircraft, not those of lighting a city. And so the things we want to talk about in this third article are those leading to the realization of nuclear engines in airplanes.

By David A. Anderson

At first glance, the nuclear engine seems about the most possible type of powerplant for an aircraft. It is big, heavy, difficult to control and impossible to approach in working limits—nuclear metals are difficult to work through usual structures. And its waste products are loaded with dose, lethal dose.

But some of these same faults could have doomed the piston engine at the time of the Wright brothers. It took long years of development and design progress to make the piston engine the safe, reliable powerplant it is today. And so it can be with nuclear engines.



►Why the Engine?—But why consider such an engine for aircraft, anyway? What are the unique advantages of the nuclear powerplant that make it worthwhile?

For this discussion, let's consider only military aspects of the long-range bomber type. This is because the limited, controlled output of fissionable material is made available now for military applications only. And short-range airplanes, be they bombers or fighters, has made out very well indeed on engines powered with chemical fuels.

Cost is another reason for hesitating the current disposition to military applications only. The price of the fuel is so high that only a military operation could be justified.

The real reason for atomic engines arises from the range and speed limitations of present-day aircraft.

Aircraft range is determined by the efficiency of the three basic aircraft components: aerodynamic layout, structure and powerplant. Range increases can be expected to come from increases

in the aircraft lifting ratio, for example, or in decreases in specific fuel consumption.

►Range and Speed—Aircraft designers know the aerodynamic and structural weight penalties in range analysis, then are burdened of course of range against speed for different conditions. And generally speaking, the speed for maximum range of subsonic, piston-engine aircraft is somewhere around one-half the maximum speed; for jet-engine planes, speed for maximum range is about three-quarters of the maximum speed.

Low cruising speeds mean long flight times to target area (with the resulting ease of intercept), more time spent over enemy territory, more time for enemy interception. To increase speed, one over the engine threshold, more burning process (fuel) that will be needed on the route back.

To increase the cruising speed for a given range and load, more power is required. More power means more fuel, more fuel equals extra weight. A heavier aircraft means a bigger aircraft.



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and a larger amount means more power.  
► **Careful Work—Laidly—Conscientiously**, the designer is guided by the scientist's state of the art. It is impossible for him to build an engine which will have a tolerably higher cruising speed and still maintain the same requirements.

This is why a nuclear engine is worthwhile.

For the first time, a designer can work with a prospect of negligible fuel consumption and virtually unlimited power. He can design an aircraft which can fly around the world at practically any speed he cares to design into the engine.

But this is not going to be done with the basic, stationary prospect that was described earlier in this series. It will require a new design approach to the basic area of power generation from atomic heat. And there will be a host of problems peculiar to the installation of nuclear engines in an aircraft.

► **What's Wrong?**The power development of the nuclear powerplant is that it is too bulky and too heavy. This is because of the particular power-producing cycle used (heat to steam to turbine to generator to motor), because of the type of reactor (slow neutron) and because of the amount of shielding required.

So the designer of a nuclear energy powerplant for aircraft first tackles the problem of reducing size and weight. Actually, he can't do this without considering the kind of engine he is going to design, that is, whether he will use a jet stream or a propeller to produce thrust. And then he will have to take into account the number of engines, the amount of the aircraft, and whether it is to be carried by launch or by launch.

The primary problem is to take a lump of fissionable fuel and end up with a stream of high energy air which will propel the aircraft. Heat must be converted into motion.

Consideration of the type of engine to use could start with the simplest engine known to be capable of producing an airplane—the jet.

► **Simplest Engine—Unlikely** The simplest is used actually, recognizing that no engine is really a simple design problem. But compared to other thermal engines, the simplest is, in its overall sense, a simple engine.

In such an engine, air is compressed mechanically, either upstream of the unit, downstream of it, or both. At pressure and temperature higher than the atmosphere, the air takes a combustion chamber where its energy is increased by the addition of heat transferred from burning fuel. The hot exhaust gas is then forced through a turbine which

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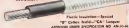
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to expand into the atmosphere and produce frost.

In a catalytic reactor, the reactor replaces the combustion chamber. Air would flow through the reactor to remove heat energy, but everywhere else the flow process would be the same as with a standard, fuel-burning reactor.

This is certainly a most tempting application. Intermediate working fluid can characterize, certainly, some cases and heat exchangers mentioned. But there are three major drawbacks. Two of these are inherent in the concept itself, and have to do with the internal flow characteristics.

• **Sensitive Throat**—The throat produced by the thermal process in a ringjet is very sensitive to pressure changes within the nozzle, for this reason, combustion engineers labor long and hard to achieve turbulent combustion with small pressure loss across the combustor. In a earlier report, transferring heat from the reactor to air means a large pressure drop, or loss, across the combustor. And this means a large throat loss.

The second inherent disadvantage is well-known, it is the thrust-speed characteristic of the concept. Under static conditions, the transport produces no thrust, auxiliary engines or Roto would be necessary.

The total disadvantages will be inherent in any nuclear engine for propulsion where, as, heated by the reactor, is discharged overboard to produce thrust. Aside from the dangerous radioactivity present in the jet, it would also be highly noised. What this would do to communication and radar equipment aboard the aircraft can be imagined. And further, the steamed jet blast would be a perfect collector for enemy radar.

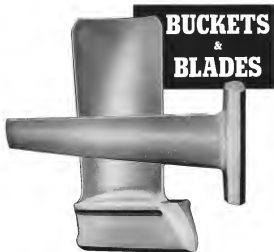
• **Other Engines**—In addition to the concept, the designer might consider nuclear turbogears or rockets. In the former, the reactor would replace the combustion chamber; in the latter, it would replace the combustion process and, instead, add heat directly to ionize ammonia.

A possible design to a nuclear turbojet would be a turboprop engine. Here, the reactor replaces the combustion chamber, and the turbine output is geared down to drive a propeller.

But each of these engines would show the disadvantage of producing a highly radioactive, unused jet stream.

The most likely application for nuclear power in an aircraft seems to be in a closed-cycle turbine engine, so basically different from the type described earlier as a stationary power plant. The turbine output shaft would be geared down to drive a propeller rather than an electric engine.

In such a closed-cycle engine, the reactor furnishes heat to a working fluid



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which expands through a turbine to drive a propeller. The fluid is then cooled in a condenser and pumped back through the system.

By keeping the fluid entirely enclosed, the danger of a radioactive coolant is eliminated. But the turbine would become contaminated, and so would condenser and pumps. This means that the whole powerplant would have to be shielded.

► **Alternate Choice**—As an alternative to shielding the reactor plant all of the components of the powerplant, a secondary heat transfer medium can be used. In this cycle, the reactor heats a fluid which is used to transfer its heat, through a suitable heat exchanger, to another fluid. This latter medium becomes the actual working fluid of the cycle; it expands through the turbine, is regulated and compressed again and again. Proper choice of working mediums will practically eliminate radioactive transfer from primary to secondary.

The advantage of this type over the former is that here, only the reactor and heat exchanger but not the rest of the cycle, is shielded. The cold side, turbine, condenser and pumps will not require shielding, ensuring proper choice of media and materials.

Selection of one of these two modes of powerplant operation is the first design choice. And that means the beginning of the metallurgical problems.

► **Where Does It Go?**—The powerplant designer, faced with installing a special amount of horsepower in an aircraft, has first to decide where he will locate the engine. His choice will depend as much as the engine's physical characteristics as its performance.

Even at the early stage in the development of atomic engines, there seems to be two general classes of engine design which will alter the final shape of the powerplant. We might call them the present design and the future design, which is the way they seem to fit into the aircraft picture.

For the present design, consider a three-section reactor. It's fairly large and the shielding is heavy because of the reaction rate. In size, it looks like the stationary powerplant we described earlier, but there have been many refinements in material choice and design layout.

Because of the size and weight, this type of engine immediately suggests an arrangement where all engines share a common reactor and heat exchanger. In a present design, therefore, the slow reaction reactor and the heat exchanger are at a central power station in the tail of the plane. Turbine engines, driving ground propellers, are at the wing. Only the central station is shielded.

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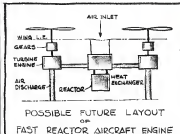
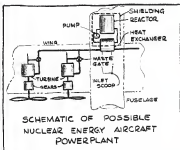
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scoop and put into the cold side of the heat exchanger. It picks up energy from the exchanger, and is piped out to the wing engine through insulated ductwork. At each engine, it expands through the turbine, driving the propeller. The cooled air is dumped overboard.

The engine is controlled by positioning a waste gate which regulates the amount of air passing through the turbine.

► Drawbacks—There are two factors about this design. The long travel of ducting from heat exchanger to engine is weighty, bulky; it causes losses of pressure and heat at the working air.

The basic reactor is bulky and heavy and so is the shielding. But it is a workable system. It uses air as the working fluid, because air is available in abundance and doesn't have to be carried along on the wings. The system is a solid one, no radioactive contamination is a problem. And with a controlled power station, repair and maintenance of the engine is simplified.

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## Comet Readied for R-R Avon Engines

Engineering the installation of Rolls Royce Avon engines for the de Havilland Comet has begun in earnest.

Objective is to give the Comet its full passenger- and load-carrying capacity over stage lengths of 1800 mi., and it is not intended to a review of improving the payload over shorter route lengths.

Inspecting one of the Avon-Comets is on the London-New York run, but this is not likely to happen for about three years. Dr. Harland says that since Avon engines, Comet may be completed and flying in about six years, but delivery times are being quoted at three years.

There has been speculation lately about conversion of the Comet to a bomber, but the British feeling is that few conversions could only be justified by an immediate war. First, there are other jet bombers awaiting completion which would be much better suited for the job and which could be built in quantity.

Second, the structural changes necessary for the Comet are concentrated in the fuselage would have to be completely redesigned to replace the belly fuel tanks with bombs, and then the wing could not be incorporated into a new fuselage because of the method of wing attachment.

## Engine Test Facility Nears Completion

Work is being pushed on the high-altitude engine test facility, part of the Air Force's Arnold Engineering Development Center at Tuslingham, Tenn. "Shakedown tests are slated for early next year."

This engine test unit will take full-size representative turboprop and turbojet powerplants to a simulated 50,000-ft level under flight speed conditions. Operational requirements will exceed 75,000 hp and temperatures must be two fast changes will be possible. Testing capacity will exceed, by a considerable margin, that afforded by present equipment at Wright-Patterson AFB.

Electrical installations contribute a large part of the engine test facility. Conducted by Pittsburgh's Allegheny Industrial Electrical Co., the electrical checking and installing divisions get test equipment and USAF components.

Cost of the completed electrical installation, including that of the Air Force equipment, will be approximately \$5 million.



## New Aircraft Actuator Uses Saginaw Ball Nut Screw

This advanced, hydraulic aircraft actuator meets its efficiency and lightweight to its quick-acting Saginaw ball bearing screw and nut. It operates satisfactorily under extremely high loads . . . features emergency power drives and synchronization for two or more units. In the event of system failure, a mechanical brake locks the actuator. Stroke and thrust are limited only by available flow and pressure.



Non-removable storm window and exterior profile increase fuselage for lighter ball (C) nose landing gear door, (D) nose landing gear, (E) wing fuel, and (F) nose landing gear. Operating load run from 1800 lbs up to 6000 lbs. Stroke range from 4 in. to 18 in. All actuators use Saginaw's lifetime ball bearing screw and nut.

## SECTION FREE TURNING NOW AVAILABLE FOR LIMITED USE

The freedom for operation of the Saginaw ball bearing screw and nut brings new efficiency to countless industrial operations. In many cases actuating efficiency is increased more than 50 per cent, while operating costs are reduced as much as two-thirds.

The Saginaw ball bearing screw and nut enables possible the use of smaller motors down with less horsepower. It permits faster response with less line movement, and allows rapid forward or reverse action with minimum wear and friction. Compact design for simple installation; remarkably low maintenance.

## SAGINAW DESIGN BACK APPLICATION TO MECHANICAL DRIVE

Each application is covered as an individual design, Saginaw makes an off-

the-shelf ball bearing manufacturing facilities are present to meet any demand production scale—large or small—and ball bearings are available in most common dimensions.

Saginaw puts its years of gear building experience behind every product it makes, has one of the largest and most highly trained staffs of engineers, designers and manufacturing gear specialists in the country.

## INSTALLATIONS FOR BALL BEARING SCREW DRIVE EVERY FIELD OF INDUSTRY

Present industries using the product are: oil refineries, machine tool, automotive, food processing, meat processing, textile, rubber, paper, and many others. It is widely employed in truck trailers, adjustable beds, lifting jacks and many other actuating devices. Complete engineering facilities are available to give prompt attention to customer problems.



General Motors Corporation, Saginaw, Michigan

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## NACA Reports

► A Method for the Determination of the Spanwise Load Distribution of a Flexible Swept Wing, at Subsonic Speeds (TN 2222)—by Richard B. Stong and Harvey H. Snow.

This method was developed to fill the need for a mathematically simple approach which would also include the aerodynamic influences contained in lifting-line or lifting-surface theories. And further, the aerodynamic effects associated with various rigid-wing loadings were to be separated out so that it would not be necessary to perform detailed calculations for each set of flight conditions.

Simple beam theory and Winger's simplified lifting surface theory are combined to get semirigorous span load distribution using minimum computer.

For that, the wing is assumed to be fixed in position as the rigid-wing loading is applied; the wing is then allowed to deflect under the applied load. It is then considered as fixed in the deformed position and the loading (due to the last deflection) is found from rigid wing theory. And then the wing is allowed to deflect again.

In the way, successive deflections are found which depend on the loading corresponding to the previous deflection. This is the procedure for the formulation of the theory; in practice, the method is considerably abbreviated.

The method can be applied to load calculations at subsonic speeds for any flexible wing with leading structural twist, camber and with structural joints.

—DAA

► Effect of Heat and Power Extraction on Turbojet-Engine Performance. IV—Analytical Determination of Effects of Heat-Exchanger (TN 2340)—by Stanley L. Kovacs.

Previous work in this series of investigations by NACA has included the study of the effects of compressor-turbine bleed and use of partial shaft power in the Turbojet, effects of bleed gas bleed from turbine and turbine inlet air stream.

Philosophy behind the extraction of power from a turbojet might be worth reviewing here. Compressor and turbine are going to need a lot of auxiliary power for operation of the auxiliary equipment. Actually this non-shaft power will only be needed for short periods of time at engine in trouble during a flight. A separate source of power-generating equipment could therefore not be working at or near the major portion of its full flight, and would, in effect, just be



**Rotary Link**—From a rough mountain slope in Korea, a Sikorsky helicopter of the Marine Corps takes off over an advanced patrol after performing its vital liaison mission. Day in and day out Sikorsky helicopters have proved invaluable in maintaining contact with men in otherwise inaccessible points—linking deep-probing advance units with troop headquarters—rapid laying of telephone wire—bringing up ammunition, hot food and medical supplies—

spotting artillery fire and enemy positions—ferrying staff officers and evacuating the wounded.

The performance of these Sikorsky helicopters has been so outstanding that the Marine Corps has ordered greatly increased quantities of the latest 33-place HO4S model. In addition Sikorsky has just been declared a winner of the recent Marine Corps design competition for a new type assault helicopter with far-reaching possibilities.

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along for the ride. And this means a reduction in available weight and space for useful load.

So the problem becomes one of power extraction from the aircraft propeller, without compromising the overall performance seriously.

The results of the investigation are presented in charts which are applicable to most flow engines with inlet compressor pressure ratios of 4 to 5 and inlet turbine inlet temperatures of 1500 deg. to 2000 deg. Rankine.

Results in a generalized form indicated that it was more advantageous to bleed gas from the turbine at constant temperature and pressure and reduced exhaust nozzle area than at constant area and reduced temperature.

Three test cases were considered, values for the latter case being 2.5 to 4 times as great as for the former.

The performance penalty due to turbine bleed was essentially independent of engine inlet temperature, but associated with flight Mach number for inlet turbine inlet temperature and inlet exhaust nozzle area operations. Increasing the engine speed or altitude reduced the performance penalty due to turbine gas bleed with a rated area turbine nozzle.

In comparing turbine-inlet and turbine bleed in variable-area operation, it appeared some advantages to increase the hot gas flow in the turbine. The reverse was found true for constant area operations.

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## PRODUCTION



**FLEXIBLE SEGMENTED SNAKE** is supported on adjustable, single blocks. Cavity in snake guides F-59 extension for stretch-forming at Northrop Aircraft plant.



**P-18 STRUCTURE** shows extensive use of POGA type finish coating. Manufactured loads as snake sheds are upset to 62 counterclock with strong swirling effect.

## Northrop's Cost-Cutting Methods

New production techniques provide improvements in stretch-form tools, fasteners, bearing retention.

Economy and efficiency are getting top attention at Northrop Aircraft, Inc. at the F-55 Scorpion production program.

Northrop constantly is examining its fabrication scheme to cut costs and its prime manufacturing methods.

Some of the processes—piping and fabrication techniques—adapted to speed its F-55 output have been outlined in two papers by the company's chief materials and process engineers, Thomas K. Piper. One was delivered at the recent Third Annual Industrial Engineering Institute at Berkeley, the

other at the Western Metals Congress and Exposition at Oakland, Calif.

**Flexible Form Blank**—One recent tool developed at Northrop is the flexible stretch-form blank for producing F-59 extensions. Incidentally, the device is suitable for localized production—adapted to responsibility short runs with rapid conversion from production of one part to another.

It can be used for custom forming of extensions and perforated sheet or plate sections of similar shapes. In its present stage of development, Piper says, the method is particularly

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adapted and a long, steel almost exclusively to form a low curve to the wing and fuselage curve as to the longitudinal curve of the fuselage.

Previous approach was to use a stretch form block of Masonite, aluminum alloy or steel alloy for such a divided part to be formed.

With the current method, one flexible metal cavity is required for each shape and size of extrusion of formed section, but it can be used repeatedly for any part conforming with a radius of 30 in. or over.

How Used—The mold is cast in one section from Cerro-Metex, a low melting point alloy, using a straight length of the actual extrusion or formed section during the casting to produce the desired cavity.

Next step is to cut this long casting into sufficiently short segments to give the desired cavity within the tolerances required.

Then, a 2-in. segment will produce a cavity of 16-in. radius or greater within .003 of the desired radius.

The segments are required by the long cast strips to give flexibility and handling ease. One set of adjustable angle blocks and cast base plate for all extrusions and formed sections of 3 in. size or less are required to complete the setup.

For the stretch forming operation, the angle blocks are adjusted for length and contour, and the flexible mold is positioned with the cavity up or outward depending on the extent of radius with respect to the extrusion cross-sectional shape. The straight extrusion or formed section is placed on the angle's cavity and gripped by the stretch jaws for forming procedure.

Thick River Solignum-Piper discussed some applications of similar fixtures. One of these, the NACA type of oval wing has been put into general production practice at Northrup for the F-89. The method is reported to give the strongest finish part that can be obtained with aluminum alloy casts in a cast continuous application.

First, the holes are drilled from 410 to 415 larger than the oval shape diameter. The surface side of the structure is then counterbored, at a 60-deg. angle, to a given diameter, usually twice the diameter of the oval shape.

The next is inserted on the side opposite the counterbore, and the shock wave produced by the pressure is approximately 14 times the shock diameter. Backing it against the manufacturing head, and the next gun depress the shock for a complete swelling effect in the counterbore and drilled hole. In normal assembly the practice is let

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In the illustration above CMH REX-FLEX flexible metal hose is used as pressure blast tube in a control transfer duct. Note the flexibility which enables installation without requiring any of the necessary qualities of resistance to heat and vibration.

Since flexible CMH products are non-combustible for over 40 years.



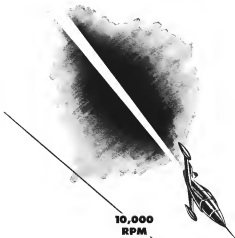
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**10,000  
RPM**

The turbine shaft of a present day turbo-jet plane makes approximately 10,000 rpm. That's about 1,600,000 revolutions on a 3-hour mission. That's an impossible rate unless friction is held to the minimum—unless bearings are able to withstand highly elevated temperatures and tremendous relative speeds.

Bearings do stand up—because of unsurpassing cooperation.

SKF has long worked closely with aviation engineers in designing, engineering and manufacturing bearings with tolerances held to millionths of inches, bearings with stresses to withstand the tremendous punishment dealt them by supersonic speeds.

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—Manufacturers of SKF and SKF-THIN bearings.



**BEARING RETENTION** is higher in bearings ground by cutting V-shaped grinders near edge of race (left), and roughing bearing outer bearing chamber with roller tool (right).



next set with a very small pneumatic hammer it goes. Pneumatic square seating is adapted to NACA seating, particularly in inherently laminating at detail parts.

After the meet is driven, hand equipment is used to shave a small finish about 1/16 of the remaining stock lead, for a high instantaneous finish.

Best materials generally used for this application are SAE (DIN) and AIT8 (AISI).

► **Blind Rerolling Helps**—Continuing on blind reroll, Piper says, "There has been considerable testimony as the part of many aircraft designers to employ blind reroll in any manner. This has been, probably in part at least, because of the lack of service performance in bearings. Many designers have deliberately refused to accept the 'new way out' by the use of blind reroll, even though a design employing them would result in appreciable simplification over the design employing 'new blind bearings'."

Mentioning one such instance application, he said that the Cherry H-1000 over incorporates good dynamic action, good strength and stability.

► **Roll-Roll Production**—In the field of special high-strength bearings he referred to the Hertz Lockbolt, used on the F-100. This also is not a new device in aircraft bearings, but Piper's experience with the bearing used is interesting.

Here are the advantages he reports: "The Lockbolt can be used in much lower operating load than the conventional ball or other high-shape type bearings. It is easily satisfied with pneumatic engagement, lowering the installation time in one-third that of conventional ball or other similar applications."

Designed as a replacement for high-strength alloy steel and stainless steel thrust, the unit, Piper says, is readily

adaptable to high-volume production methods.

It is available in 708-T5 and can at least a weight saving of approximately 25 percent over an equivalent AN steel ball and nut.

He says that both the steel and stainless alloy Lockbolts have high tensile strength and excellent seating qualities. Under inspection loads in stress, the unit is stronger than stainless steel for short material in normal joints.

Tension fatigue tests indicate that Lockbolts last many times as long as AN bolts (because of the uniformly high particle) when tested at any specified tension level.

The unit stamps the work tightly with sufficient force to produce the gap in between comparable to a highly tapered bolt, but with much greater consistency. This high tensile strength means excellent tension fatigue strength.

The clamping action, Piper says, is sufficient to pull together a total gap between shaft of 0.1 in., hence the Lockbolt does the work of clamping or fitting bolts, but cannot permanently fail.

► **Bearing Retention**, Salsed-Piper reports that retention of bearings is a current production headache. Shaking of bearings, he says, is an annoying problem with the primary structural speed and consequent boost in bearing loads in jet engines. Shaking will not prevent the required seal retention in the many critically loaded bearings in a modern fighter.

To overcome this difficulty, he says that a new oil seating method has been developed for bearings using bearings of approximately the same thickness in the bearing shell. A V-shaped groove is cut around and over the edge of the line and a roller type tool seizes a slug of bearing material over the shoulder of the bearing.



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cally designed for night combat. Equipped with electronic devices for early detection of enemy aircraft, the Skyknight is adaptable as an attack fighter, long-range patrol or reconnaissance airplane, or as a long-range fighter escort.

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## Certificates of Necessity:

### Aircraft Industry Gets \$157 Million

Aircraft's aircraft and related industries, including subcontractors and suppliers, have been issued approximately \$157 million in certificates of necessity out of the total of nearly \$3.2 billion in certificates authorized by the National Security Resources Board between Oct. 25, 1950, and Jan. 25, 1951, and its revision, the National Defense Administration in the period from Mar. 7 and Apr. 6 of this year.

The certificate authority failed to deduct from taxable income 46 to 106 percent of the cost of expenses of necessary defense facilities during the past five years as compared with normal amortization period of 20-25 years permitted by the Bureau of Internal Revenue. This payment was provided by Congress in the Revenue Act of 1950 to encourage rapid military production expansion.

Listing of the values follows, in order of dollar value. Also given is the year from facility for which expansion is desired. The figure in parentheses indicates the percentage of the total that can be depreciated in five years:

Chesapeake and 40-100 and Jan. 11, 1950  
United Aircraft Corp., 7740 E. 10th St.,  
Albany, N.Y. \$1,000,000 (100%)  
Republic Aviation Corp., Farmingdale,  
N.Y. \$1,000,000 (100%)  
Thompson Engine, Inc., Cleveland, 30  
E. 10th St. \$1,000,000 (100%)  
Sikorsky Aircraft Corp., Stratford, Conn.,  
\$1,000,000 (100%)  
Sikorsky Aircraft Corp., Stratford, Conn.,  
\$1,000,000 (100%)

Hamilton Standard Tool Div., Hartford  
22 Elmwood Ave. \$1,000,000 (100%)  
United Aircraft Corp., Hartford, Conn.,  
\$1,000,000 (100%)  
United Aircraft Corp., Hartford, Conn.,  
\$1,000,000 (100%)  
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## NEW AVIATION PRODUCTS

### Fuel Tank Sealers

Two seals for original fuel tanks in aircraft, compressed to remove high fire fuel and adhesion through a safe range of temperatures (-105 to 225°F) and resistant to gasoline and oil, are being marketed by Minnesota Mining and Mfg. Co.

The seals, tagged EC-1120 and EC-1130, have a synthetic rubber base and are designed for a good sealing and resealing of fuel tanks. They meet requirements of Air Force Specification 14155 and are light tan in color. The company believes this seal is more desirable to handle than dark or black compounds and that the light color will facilitate inspection of coatings.

The new seals differ mainly in viscosity. EC-1120 being a brushable type and EC-1130 designed for caulking gun application. On addition of an accelerator, they both cure to tough rubbery seals.

When fully cured, they have a Shore A Durometer hardness of 50-60 and high tensile strength. This latter property, the company points out, becomes increasingly important at higher altitudes. Some seals require no air bubbles trapped in them, and, but it asserts the new seals are able to withstand such stresses. Also, aging is said to have virtually no effect on them.

Strip bond tests with cured film also show the seals have considerable flexibility and adhesion at -105°F. They also have been tested over a 2-in. diameter at -75°F without failure. EC-1120 weighs 139 lb./gal., while EC-1130 comes to 14.6 lb./gal. Ad dress 906 Triquetra St., St. Paul 6, Minn.



### Compass Pointers

Two new rich compass indicator heads (model 7000) designed for use with conventional compass systems now are available for immediate delivery by Aviation Electronics, Inc.

Units, bearing bearing shafts, are designed Model ADP-51 and ADP-52. The ADP-51 is a single, five-sided unit with a rotating compass scale having one degree graduation. CAA certificate 4844 and is in proof at 5177.



### Inside Information

A "passage" over the dark interior of aircraft engine cylinders with out disassembling them is the object of the "Borescope," developed by the Testa Mfg. Co.

The Borescope is a line, slender optical instrument 14 in. dia., 18 in. long, sealed to a microscope, which can be inserted into the cylinder through the threaded hole normally housing the sparkplug.

The unit also can be used to inspect cracks, bad valve seats, gas burns and other surface failures from normal view.

The device is provided with both a dimension and 1/8 in. illuminated and half, corrected lens system, providing a sharp, magnified (two to ten power depending on target distance) and brightly lighted image. The angle of the optical ground mirror which reflects the image into the lens can be adjusted in its normal position, the mirror will produce a view which is at right angle to the Borescope tube.

The Borescope permits the user to see the internal surfaces of the cylinder head as well as the walls. It can be used to determine cracks, pitting, cor-

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Branch: 1601 Triangle Drive, Wm. Del., D.E. 1, D.E. 1



Another consideration

room and other details which may lead to a breakdown in operation. Inspection with a microscope may avoid disassembling a part.

The wiring end of the device has a large eye cap. This can be pulled out or pushed in for coarse focusing and then rotated to obtain a fine or sharp focus. The unit is provided with an electric cord. The bulb can be removed by unscrewing the top of the tube. Address: 410 S. Peoria St., Los Angeles.

## Altimeter Computer

Greater bombing accuracy is provided with development of a new potentiometer for radio altimeters.

The device can measure altitude on bombing missions "within a maximum error of about one-fourth that formerly considered unavoidable," reports its maker, the General Electric Co. of Newton, Mass. The company, presently a producer of emergency signaling systems, has expanded its production facilities to meet quantity orders for the unit.

Accuracy of the potentiometer is part depends on precise production techniques and other aspects. General Electric says a variety of one-eighth of an inch to one-half inch used in the unit would necessitate changing the potentiometer for recording altitude tolerances.

## ALSO ON THE MARKET

Ribonair and ribbon racing military equipment include standard and optional chassis (17 models) built to Spec. JAN-R22 and available in case files 25 to 750 watts, wire-wound resistors (35 types) racing components of Chassis "C" and "T" of Spec. JAN-R24. Made by General Electric Co., 4001 Florence St., Chicago 14.

"Ribonair," designed to replace steel shipping, can be uniformly tensioned with standard Stofender shipping tool to maintain or protect against or prevent. Milder says this avoids variations in tensioning which occur when shipping is applied by hand pressure only. Material has non-abrasive and non-adhesive surface, is 1 in. wide and 1/4 in. thick. It is available in 25 lb. coils, 1,750 ft. long, from A. J. General & Co., 1959 N. Hawthorne Ave., Melrose Park, Ill.

Inside calipers available in solid and type and larger diameter, tubular style, feature "Satin Chrome Finish" to eliminate galls for other reading. Measuring capacity ranges from 2 to 12 in. (solid style) and 1 to 12 in. (tubular style). Made by L. S. Stewart Co., Athol, Mass.



In  
**Aircraft Fan Design**

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**AXIVANE**  
**FANS**

Offer **All These**  
**Advantages**



## CAST-IN STRENGTH

The outer casing, intermediate discs, and the inner casing are a single casting to provide maximum resistance to shock, and to prevent strain under working conditions.

## LIGHT WEIGHT

These fans are not only compact in design, but are available in either aluminum or magnesium to reduce overall weight to a minimum.

## VANEAXIAL DESIGN

Sanitary vane design provides an equal pressure and velocity distribution at all points across the fan outlet, thus producing an air flow pattern substantially free from turbulence.

## AERODYNAMIC ENGINEERING

By the blades and vane axial vane of Joy blowers employ aerodynamically efficient vane shapes, so insure the most favorable electric-motor power ratio.

## PRECISION CONSTRUCTION

The squared-off blade tips clear the casing by only a few thousandths of an inch to maintain up loss, a common cause of fan inefficiency, and to reduce noise.

## COMPLETE LINE

Joy offers a wide selection of standard single or two-stage straight fans, as well as custom-designed types, for all ventilation, heating or cooling problems in military and commercial plants. Optional features include straight or forced inlet, beaded or flanged connections, radial vane-dispersers, and/or cooled means where required.

## UNMATCHED EXPERIENCE

Joy is the world's largest manufacturer of standard fans and blowers. Fans for all purposes, ranging from 1/25 H.P. to 5000 H.P. and up, with fixed, adjustable, or controllable blade pitch, constitute the unequalled background of JOY engineering experience.

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# AIR TRANSPORT

## All Weather Program Alterations

Reworth & Development Board, keeping within the reduced \$1,390,000 Air Navigation Development Board fiscal 1952 budget, has altered the project list which was set up after the Mar. 5 cut, maintaining some projects, dropping others, adding one new one. The complete list of projects was printed in Aviation Week Apr. 2, page 16.

### REINSTATED AFTER MAR. 5 CUT

- Proj. 22 (New) Development of electronic projects (intercepting radar)
- Proj. 44 (Weather Bureau and General Research Foundation) Meteorological forecasting research to improve prediction of airport acceptance rates.
- Proj. 44B (No contractor) Development of improved air traffic communication.
- Proj. 63 (Air Force) Evaluation of 1,000 and 5,000 ft instrument landing systems and other navigational aids.
- Proj. 73 (Bureau of Standards) Study of propagation in the 900-1,600 MHz region.
- Proj. 72 (Navy Bureau) Development of aircraft antenna.
- Proj. 78 (Army Signal Corps) Development of 1,000 ft airborne transmission.

### DROPPED AFTER MAR. 5 APPROVAL

- Proj. 52 (AF, Watson Laboratories) Development of airport surface detection equipment.
- Proj. 52 (General Electric) Development of Altair model electronic communication study.
- Proj. 96 (Aeronautics Lab) Development of experimental measuring apparatus for ultimate precision approach radar.

### NEW PROJECT ADDED

- ..... Data reduction problem study.

with RDB approval. Four that were kept are now dropped; one new project is started.

► **Compass System Scrapped**—Here are latest developments in the all-weather systems, similar and traffic control development action, as outlined in Aviation Week by RDB Chairman W. W. Webster.

► **General system delay.** Webster says: "The ultimate system (of air navigation development for all weather) will be delayed. This delay makes it likely that the results of research during the next several years will lead to significant modifications to the ultimate system."

► **Compass system concept.** The compass system concept of military and civil aviation on non-protected all-weather flight instrument and equipment is formally challenged now in official RDB policy RDB rules. "Operational experience with the transition and other systems may lead to a modification of our concept of a compass system."

Choosing on the interpretation of this Aviation Week was told by an RDB spokesman: "The compass system plan originally worked with instruments. Experience may change the compass system concept."

► **Navigational Committee.** Defense Department's RDB will not accept its Navigation Committee. It was the turning up of that committee (not being up to get inter-service agreement on a compass system) that opened the way for the services to cut the ANDB program down to quarter-sized with all clearing with RDB.

► **Development Director.** Commanco Department has been asked by Defense to take over the job of funding and giving a director of development for ANDB. (ANDB was originally set up in 1948 as a joint Defense-Commanco board). The joint services and GAA organized it to develop a common all-weather flight system for AF, Army, Navy and GAA, taking over a job they used to do separately and differently.)

After three months' work, the two agency representatives on the ANDB have not yet found a new director, all development, while the director at a rate going up to \$120,000, the highest current salary available in a case to head development of all-weather flight is reported at \$118,000. Defense was paying the director at a rate going up to \$120,000. ANDB charter changes. RDB Executive Secretary Joe Wilbur is working with some of the RDB staff on plans to transfer the ANDB to the Defense and Commanco. He is authorized to do this together.

Although the military services cut ANDB all-weather research down to nearly short-term projects, the services now will go on with their own long-

term projects. Big difference is ANDB's loss of coordination. And Navy may have shared on its own special navigation system.

► **New Year-RDB chairman.** William Webster told Aviation Week last week that the board is now looking at long-range all-weather flight development plans now. The looking is that with the services' older already available, new ideas, new electronics and new experience may dictate a radical change in the ANDB long-range program. But, Webster promises, without

a year RDB will have another look, at any rate.

Some sources observe some possibility of a move to the old position of project or production director, although waiting for one such device must.

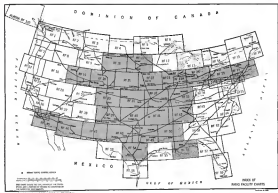
## Local Service Chiefs To Stage Seminar

Executives of all the local service airlines will hold a policy and open-

ness seminar at Purdue University, Lafayette, Ind., on June 21, 22.

They picked a midwestern university for data conference because the timely setting (Midwest) is most anxious for help in promoting the use of local air service.

Chief problems on the agenda are Midwest city problems in building local air service. Issues on all first-day local questions, DCA's significant photo-type aircraft development, separate of road pay from subsidy and modification.



HIGH FREQUENCY VOR radio facilities charts have been issued covering about two-thirds of the country (shown by shaded area above).

## Work Pushed on High-Frequency VOR Airways Net

Within a year to 18 months the high-frequency VOR, almost complete system should be completed for the whole U. S. Right now, about one-third of the country is covered by designated VOR airways and two-thirds is covered by the VOR Radio Facility (RF) charts, issued by the U. S. Coast & Geodetic Survey. A VOR chart is issued long before the area is completely VOR equipped.

Until the old low-frequency range system goes out of use some years from now, Coast & Geodetic Survey will publish two chart series—the standard low-

frequency and the new high-frequency VOR charts.

Any place with VOR receiver should have both Radio Facility chart series for each region it may pass over. The charts are held for any landing, with the VOR, having the low-frequency RF chart at the same region. The charts at the two different type charts are (for the pre-proposed metropolitan New York area) "U. S. RF 25" for the low-frequency chart and "U. S. VOR RF 25" for the new VOR facility chart.

The charts will be published in several form every time there is a change

of equipment. For instance, Kansas City airport's VOR system is being changed, with its location at VOR facilities and runway at Columbus, Kansas City and Kansas City. Changes will appear in the Airway Guide and a new chart will come out showing the revision.

Some long airways are now covered by VOR signals. Continental Airlines was the first to get a complete direct route approach for 100-percent VOR navigation. Chicago New York is a route which will soon be completed on VOR.



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We special inspection tools or gauges are required. Torque checks are eliminated. Inspection of Hi-SHEAR permits a rapid and accurate check for good workmanship.

### Other Hi-SHEAR Features

- Hi-SHEAR design means smaller fit, longer and lighter structure.
- Endless parts and modeling—they make it so rough to install surface.
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- Office is based on style and cost.
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It is a fast, easy, simple—there is no doubt.

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Hi-SHEAR Rivets are made in a fully automatic machine.

## CAB Happy to Grant SWA Mail Pay Cut

Swire Airways' recent report to serve its mail pay reduced line loss approval by CAB. Considering Swire's loss for its post route in Hong Kong, CAB proposed a \$111,000 reduction in its present annual rate. New rate would be about \$379,000 a year.

The Board in June, 1951, set a final rate yielding 40.85 cents a mile in 1951. This new rate would yield about 33.49 cents a mile, effective May 1, 1952.

Swire also filed for the reduction in April. Carrier said passenger revenue was higher than expected and would justify interest rate.

CAB's consideration in Southwest route. "By increasing the proposed rate, the carrier has not only shown good faith as to its desire to decrease its dependence on mail pay support, but has also led the advantage of a procedure whereby the old rate will be replaced gradually by a final rate under which such advantages as may accrue in the form of good savings under cost control and efficient management will accrue to the carrier."

## Interchange Backing Seen in CAB Actions

The Civil Aeronautics Board says it will look at every possible way to arrange New York-Havana service by other carriers.



AMBASSADOR ROUGHES IT

British European Airways' first production Ambassador, undergoing accelerated 250-hr flight testing, flew 12.5 hr in less than five days by May 16. The tests are being made to supplement the L300 hours of prototype trials. The acceleration program also includes at least 50 hr under fatigue pressure, using maximum differential on each

axis. This is the meaning of the recent CAB order proposing a National Airlines-BEA interchange, New York-Havana, and the Board's suggestion that Panam might participate in the proposed Pan American-BEA interchange.

CAB is now studying the potential interchange operation to give New York-Latin America service via National-Panama, National-BEA, Eastern-Pan American, Eastern-BEA, Eastern-Panama.

BEA will also stand for a route extension, Havana-New York, to give New York-Latin America service with an interchange. BEA will also stand for it to operate this as a temporary operation pending final decision of the New York-BEA through-current proceeding, involving all the carriers.

CAB has already given tentative approval to a National-Panama interchange, pending results of the big proceeding.

## NAL to Fly Nonstop Havana to New York

The Civil Aeronautics Board has granted National Airlines permission to fly New York-Havana nonstop.

Competitor Pan American World Airways and Eastern Air Lines objected. But CAB says Pan Am and Eastern will suffer only "inconsequential" loss of traffic through National's improved service to Havana. NAL previously had to stop at Mexico or Tampa. The Board's action is to take effect in August.

## SHORTLINES

► **American Eastern Airlines, C.A.**—Expenditure should be given a longer term period to carry passengers, mail and cargo from Quito to Guayaquil, via Panama, to Miami, says CAB Examiner Curtis C. Henderson.

► **British European Airways-BEA's** February traffic was the worst since November, 1948, but March revenues bounced back to 25 percent over a year ago. March deficit of \$460,000 is 16 percent under March, 1950. The loss factor in March, 1951 was 68 percent, compared with 64 percent a year ago. BEA's own loss factor for BEA is March would have been 74 percent of capacity, whereas a year ago BEA would have needed a 56 percent loss factor to break even.

► **Colombian Eastern Airways-Col East** has signed a lease-purchase contract with Pacific Aeronautics Corp. CEA will use the engine service on its Tokyo-San Francisco route.

► **Eastern Air Lines-EAL** planned to inaugurate the first direct service, Chicago-San Juan, last week. EAL, however, will give the Midwest its first through one-stop link with Puerto Rico, the carrier says. Flying time is about nine hours.

► **Hawaiian Airlines-Dupont's** 1950 net loss of \$51,730, President Stanley Kennedy was Hawaiian in a good financial shape. He blames the loss on a general loss of confidence and the heavy loss, plus (started by Trans-Pacific Air Lines) Hawaiian's passenger revenue was up only one percent though load factor was up 10 percent. At one time, Hawaiian would have taken in \$230,000 more than it did, Kennedy says.

► **Helicopter Air Service-Chicago's** helicopter engine service was ordered CAB permission to fly East-west planes.

► **Mid-Continent Airlines-MCA** reports a net profit of \$1,616 the last quarter of 1951, compared with \$38,455 a year ago. Operating revenues of \$2,170,315 were 15 percent over a year ago, but operating expenses were up 26 percent.

► **National Airlines-NAL** reports a net profit of \$242,117 for the year ended March 31, 1951. Net operating income this April is \$460,750, about double a year ago. There was no re-

come tax on April, 1950, but a \$305,105 tax on April, 1951.

► **Northwest Airlines-NWA**, last week stopped up scheduled U. S. Kana flights to two a week via Tokyo to Paris.

► **Oakland Municipal Airport-GAA** has granted Oakland Board of Port Commissioners \$108,700 to cover 54 percent of two projects—\$75,400 for high capacity runway lights and \$114,300 for a sub-station for production system and extension of field drainage.

► **Pan American World Airways-CAB** recent investigations report says probable cause of the Jan. 5 Stratocruiser landing accident at Heathrow Airport, London, was "the captain's action in unsuitably placing the landing gear on the runway." None of the crew of nine was injured; there were no passengers aboard.

► **Pan American-Globe Airways-Franco** has filed its seventh consecutive year without a serious accident; this is the best safety ratio record for operations in Latin America, the company says.

► **Philippine Air Lines-Carter** is promoting round the world travel with the slogan "Go and Arrive on a One-way Ticket." A San Francisco-Tokyo round trip via Manila costs \$1,675, if you come back by going around the world it costs only \$25 more for the whole trip—\$1,700. Philippine's April schedule of DC-6s deeper planes replaced 9 to 15 one daily flying time. The high utilization rate was on regularly scheduled flights between Manila, San Francisco, Tokyo, Hong Kong and London.

► **Robinson Airlines-Local** service time is more an experimental local service map and weather information service, available only based on reports at over 800 points in the U. S. are automatically down at Robinson's (Hawaii, N. Y., Maine base three times a day. It is a New York Times Trans-Pacific Carrier. Robinson says it is improving forecasting and flight planning of flight dispatches.

► **Scandinavian Airlines System-SAS** gross revenue in 1950 was \$79,400,000 and should be next percent to about \$12,000,000 this year, the company says. Total \$48.8m of 55 planes includes 12 DC-6s, one DC-4, 14 DC-3s, six Lockheed, one Scandinavian flying boats and two Lockheed 54. Caravelle has an order two DC-6s. SAS says BDL, its Danish partner in the three-star Scandinavian system, is the world's largest airline. BDL was founded Oct. 20, 1918, with regular service, Copenhagen-Warsaw, flying a Fokker-Drachengedee.

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Thank you, LEEDS & NORTHRUP



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## LETTERS

### Jitney Airlines

I read with great interest your article, "Jitney" (Oct. 10, 1965, "71 Reader Service") in your April 30 issue. However, I don't believe that the true problem of the single-engine carrier has been made clear.

As you stated in your article, single-engine carriers are forced to go to large airports in order to obtain the cost of ground operations and fuel cut. It is a valid complaint that our Civil Aeronautics Board's regulations concerning an entirely new phase of the transportation industry have not been tailored to fit single-engine aircraft.

It is not only unbelievable but absolutely unnecessary for ground operations of single-engine aircraft to be as high as ground operations of DC-3 aircraft.

A review of single-engine operation finds ground operations causing two-thirds of the total cost. When you take into the airline and find three more single-engine aircraft operating on a charter basis probably at 15 cents a mile, you should think the government is generous. Just don't go to work in 45 cents a mile! A two-passenger aircraft is capable of looking at a single-engine aircraft and a DC-3 and asking that ground operations should differ greatly.

In the same article, using a following line, we come to the subject of a pilot's pay for single-engine operations. It is a shame that airline corporations suddenly can make money over our government in that a pilot of a two-passenger airplane does the same duty as a pilot of a DC-3. If the CAA were to commercialize losses in a pilot's pay to carry a certain certain workload in the industry by then, wouldn't it be many times more for the same pilot to fly the same aircraft over the same route day in and day out? The CAA evidently feels that it is necessary for a pilot to meet the requirements of a Continental pilot in order to fly a four-passenger single-engine aircraft.

You point to the high cost of the single-engine operation, and under the existing CAA requirements (line item 4) that. However, with a new group of operating requirements pertaining to single-engine scheduled operations only, the cost per mile could drop the 300 percent of what it is now. This would compare to 10 cents per mile which is not unreasonable.

You also point out the fact that first class travel fares are no longer a real cost. Why shouldn't a scheduled carrier charge eight cents a mile? The public is more than willing to pay a little premium for the air travel service.

If single-engine aircraft can be operated for 10 cents per mile profitably, which figure is an accomplished fact, and if that single-engine carrier could average a passenger load factor of one passenger during its last year of operation, then per mile cost per mile would be a total of 15 cents per mile.

Not only could single-engine service but large airline companies would be brought to a great realization of new people. No longer would it be a low-level jet from

Seattle city to large airline terminal and then on bus and 20 minutes flight to a distant town.

Larger airports would profit greatly by a large network of single-engine carriers. Having 100 to 200 miles into that main trunk route, the traffic is being completely moved by the large air carrier because at the time it takes to fly to the main trunk line, the traffic is being moved to the main trunk line.

Each year there are nearly millions of potential passengers lost just by the big carrier in its inability simply because scheduled or unscheduled service is not available only from metropolitan area to metropolitan area. There are from 15,000 to 20,000 persons without an opportunity of DC-3 aircraft.

What is undoubtedly still needed, are active funds as much as the word. They are huge route systems that themselves and accept each year to salvage in such a point that they become typical carriers.

It is a general that the available single-engine aircraft in America today are not the most practical aircraft for single-engine scheduled operations. However, (1) The available aircraft are not used and profitably provided we do not make the mistake with the general assumption (2) The future development of a pilot and passenger aircraft would greatly aid the single-engine airline development as well as aid the airlines of the present type aircraft is possible their plan is operation at all times.

The type of aircraft he built and is possibly being built or Canada by the de Havilland Aircraft Corp.

He, at least, can build single-engine aircraft and use it in a real way. Let us look toward the future and use it as it can be for the future of 15,000 to 20,000 passengers which make up the majority of the state of the nation to have scheduled passenger and mail service of the type.

These people represent the great majority of the first priority citizens. They are, we are entitled to consideration.

The above figure and representation which I have made here are not pulled from thin air but are based upon thousands of scheduled single-engine airlines and airlines operated by BACA Airlines during the past year.

J. BARNETT, Business President and General Manager BACA Airlines, Montreal Airport P.O. Box 151, Jefferson City, Mo.

TWA Houston New York interchanges, we correct in every detail but I would like to point out an error made in your map on page 68 on John American Airlines.

The application of Chicago & Southern and Pan American World Airport for a Chicago-Memphis City interchange at the Houston, Texas, and not on New Orleans as shown on your map.

MURRAY B. BAKER, Asst. Director of Public Relations Chicago & Southern Air Lines, Inc. Memphis Airport Memphis 3, Tenn.

### Equipment Overhaul

We note on page 17 of the April 30 issue that the picture of the 202 is that of the original (obsolete) configuration. We feel that that we have learned pictures of the current configuration so that the deletion of this can be used as a tool.

The breakdown of overhaul time in your April 30 issue is most interesting and, I am sure, will be of interest to operators of all types of office equipment.

KENNETH W. DAWSON, Director of Public Relations The Glass & Martin Co. Baltimore 3

### Praise

I am extremely appreciative of the editorial comment about me and the Alabama Department of Aeronautics in your issue of April 16. You have most graciously taken the time of your staff and I thank you for it.

All of them we have tried to operate the department as an economical, efficient and productive base. We will continue to do so.

AL B. REEDER, Jr., Director of Aeronautics State of Alabama Department of Aeronautics 105 Church St. Montgomery 4

Your editorial concerning the Conquestor article, "Don't Fly the Unregistered Airmen," was read with a great deal of sympathy and appreciation.

A copy of my letter to Horst Magazine, Inc., is enclosed.

JOSE C. FARRINGTON, Manager University Airport University of California Davis, Calif.

We would appreciate permission to distribute to State Department members throughout the world the following and possible applications in local publications "The American Day World Tourist" by George L. Clayton from the Mar. 12, 1955, issue of Aviation Week.

PAUL FARRINGTON, Secretary Department of State Washington 25, D.C. New York, N. Y.

### Interchange Maps

We have at Chicago & Southern were very interested in the April 16 issue of Aviation Week which, on pages 68 and 69 gave a summary of interchanges since our change of routing.

Chicago & Southern now has two interchanges operations before the Board, one with TWA, the other with the American. Your map on page 68, describing the C&S



## technical bulletin

### MOTOR ACTUATORS FOR AUTOMATIC FLIGHT

Today's aircraft fly on the edge of human capabilities and endurance. A transition from conventional piloted aircraft to pilotless types is taking place. The development of lightweight power units to actuate controls is a primary factor in the achievement of automatic flight. These units are being designed and produced by EEMCO in close cooperation with the builders of tomorrow's aircraft.



**Rotary Actuator for Rugged Duty** This Rotary Actuator was designed for use in aircraft systems in a long range bomber involving the most rugged duty cycle. It operates almost continuously with the maximum pilot Required duty cycle is one second full load, one second off and one second full load at opposite direction. Maximum lifetime is unlimited and high temperature materials used throughout.



**Simplified Actuator for Large Jet Fighters** This unit incorporates two motors of different size driving into individual gear reduction to operate the same jack. Small motor of 1/10 h.p. output operates almost continuously with maximum pilot. The large conventional duty 1/2 h.p. motor provides manual operation of screw jack by pilot for emergency.



**Double Motor Power Unit** This conventional system operates the horizontal stabilizer on a turbo-prop aircraft of recent design. A small continuous-duty motor of 1/10 h.p. operates through a gear reduction in conjunction with automatic pilot. Large motor rated duty 3/4 h.p. motor with direct drive of 11,000 rpm is used for manual operation.



**Rotary Actuator Package** This system provides manual or automatic pilot elevator operation on one of the latest jet fighters. Totally enclosed in a metal package with mounting bracket, a stainless steel, magnetic coil, roller screw drive and ball. Gear reduction, and auxiliary gear reduction operate adjustable travel from switches and position indicator. Output rpm is 5 rph — possible loads, 2500 Weight, complete, 15 pounds.



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REPUBLIC F-84 THUNDERJET POWERED BY ALLISON J33 TURBO-JET



## Experience where it counts most --in the air

The U. S. Air Force and U. S. Navy have accumulated more than 800,000 hours of actual flight operation with Allison Turbo-Jet engines in the aeroplanes shown on this page. This is more time in the air than the jet engines of any other manufacturer in the world.

Represented in this broad background of experience are thousands of hours of flight time on both J35 axial and J33 centrifugal flow engines—with and without afterburners—on the two models.

Now two new Navy planes are flying with Allison Turbo-Prop power. Here, too, Allison is the leader with its Navy-sponsored T40 twin Turbo-Prop engines out in front gaining in-the-air experience.

It's experience that counts—and these turbine engines have it where it counts most—in the air—in these airplanes.

Allison J33 engines also lend assistance to reciprocating engines in the

Martin F4M and North American AJ-1.

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GRUMMAN F3F-3 PANTHER POWERED BY ALLISON J33 TURBO-JET



NORTHROP F-89 SCORPION POWERED BY TWO ALLISON J35 TURBO-JETS WITH AFTERBURNERS



DOUGLAS A2D SKYHAWK POWERED BY ALLISON T40 TURBO-PROP



CONSOLIDATED PSY FLYING BOAT POWERED BY FOUR ALLISON T40 TWIN TURBO-PROPS



LOCKHEED F-34 ALL-WEATHER FIGHTER POWERED BY ALLISON J33 TURBO-JET WITH AFTERBURNER